Amendments to the Specification

Please add the following new paragraphs after last paragraph appearing on page 10 of the specification:

Figure 1 is a block diagram of an algorithm for rapid endmembers determination (ALRED).

Figure 2 are chart diagrams of spectral angle which treats spectra as vectors in a multi-dimensional space. Coordinate axes of this space are the individual wavelengths for the spectra.

Figure 3 is a chart diagram of spectral angle clustering. The shape of the spectrum is represented by its spectral angle. A supposition says that items with the same reflectance spectrum with different illuminations should have the same spectral angle, but different apparent reflectance magnitudes. Objects of similar spectral shape should cluster along direction even when illumination varies.

Figure 4 is a chart diagram of principal components analysis (PCA). PCA is used to reduce the dimensionality of the data set. PCA also further separates classes of pixels along spectral angle. Time consuming, but vital to reducing the search time for clusters along spectral angle directions.

Figure 5 is a chart diagram of pattern recognition. A line from the origin is incrementally swept through the data. At each angle, a merit function is calculated for the data with respect to that angle. The merit function preferentially weights points along the chosen angle and far from the origin (to be resistant to noise). Peaks in the resulting merit function map represent a distinct class of objects.

Figure 6 is a chart depicting Bayesian unmixing which converts spectra into probability distributions. Uses Bayes' Theorem to 'unmix' the fractional contribution of each endmember and constrains the unmixing result to have coefficients for each endmember $0 \leq C_i \leq 1$, $\Sigma C_i = 1$.

Figure 7 is a chart diagram of a convex hull model. Endmebers are corners of simplexes fit around the data set. Points inside the simplex are linear combinations of the vertices with coefficients summing to one. Different view of things than Spectral Angle.

Figure 8 is a chart diagram of fast endmember retrieval. Outliers in magnitude at individual wavelengths are good endmember candidates – and are easy to find.

Figure 9 are chart diagrams of normalization. The min/max approach will not always find the simplex vertices. Simplex vertices don't tell the whole story - -we really want unique shapes. Pixels with unique spectral shapes may be missed due to pixels with overall higher reflectance or greater illumination. Normalization solves this - - note that we are no longer really trying to grab simplex vertices.